NWS JACKSONVILLE

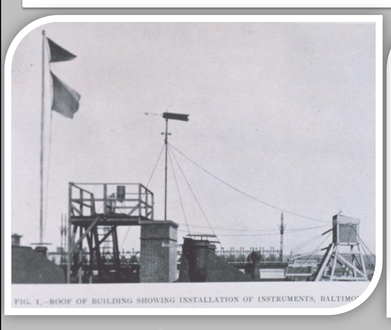
Weather Bureau Office (1911)

HOW TECHNOLOGY HAS CHANGED THE WAY THE NATIONAL WEATHER SERVICE GATHERS AND USES WEATHER DATA

Weather Service Office (2010)

Weather Observations

1871: U.S. Army Signal Corp publishes its first weather maps, using the nation's telegraph network to collect and plot simultaneous reports from weather observers. The Corp uses this data to begin issuing short-term forecasts.

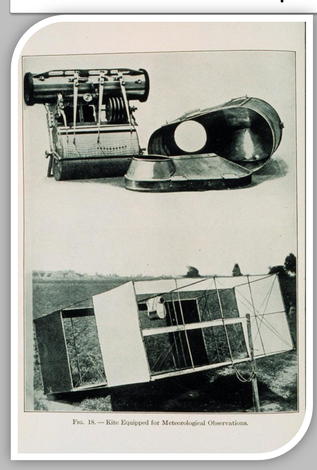


Weather Bureau Instruments (1899)

First weather map published by U.S. Army Signal Corp (1871)

1937: Weather Bureau begins using radio to transmit temperature, humidity, pressure, & wind data from instruments carried aloft by balloons.

This replaces previous methods that used kites, airplanes, & primitive data recorders. Collecting upper air data is critical to predicting the weather.



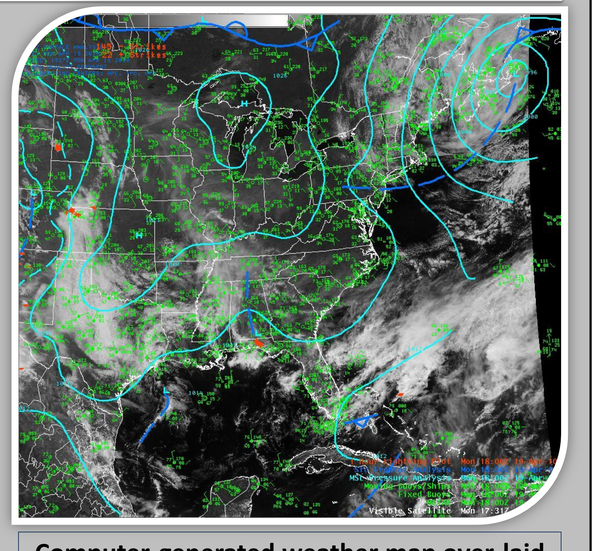
Weather Bureau kite and recorder from 1912

Pre-launch check of a balloon and early radiosonde

Today: Surface & upper air observations are taken all over the world. Buoys, ships, and airplanes also contribute to the observation network. **A**utomated **S**urface **O**bservation **S**ystems (ASOS) continuously collect surface weather data. Global Positioning System (GPS) is used to track radiosondes. T1 lines, radio, & satellites rapidly transmit thousands of observations, while computers help process the data.

ASOS

National Data Buoy Center buoy with weather instruments

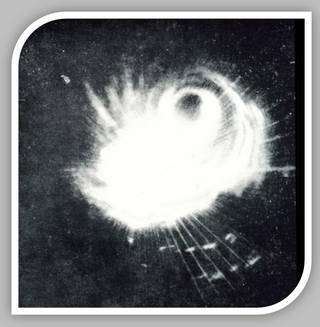


Computer-generated weather map over-laid with hundreds of surface observations, a visible satellite image, & lightning strike data

RADAR – RAdio Detection And Ranging

WWII: Military begins to understand that radar can be used to detect storms as well as aircraft.

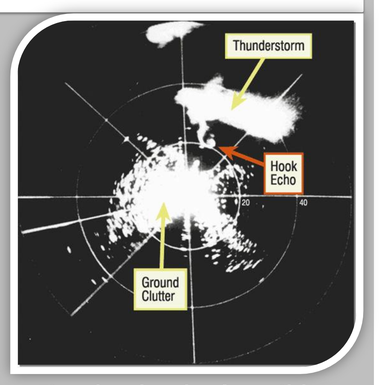
Army Air Force mobile radar for storm detection (1945)



Rain pattern from a Pacific typhoon in 1944

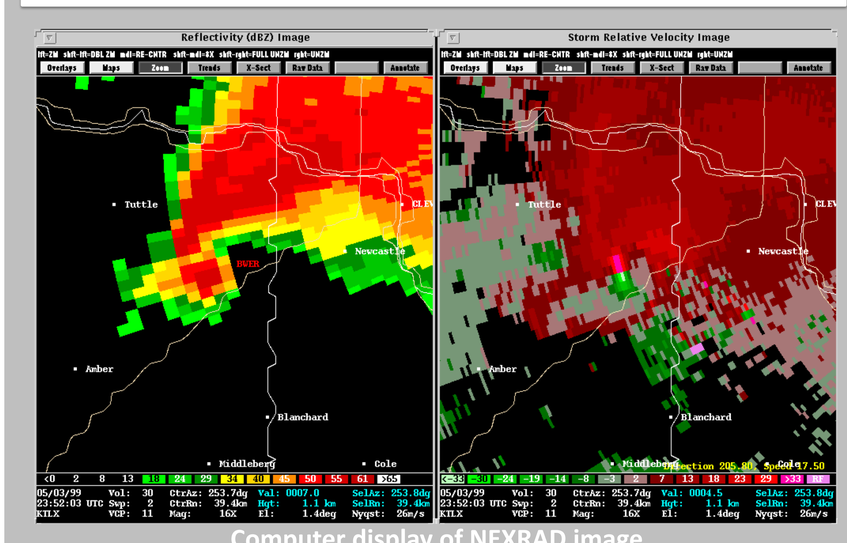
Late 1950s: First network of weather radars is established. Scientists begin to detect patterns associated with hurricanes & tornadoes.

Weather Bureau radar console (1957)

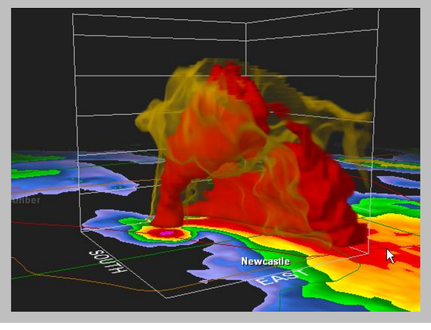


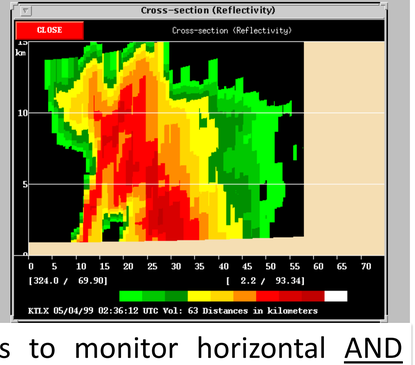
First *hook echo (possible tornado) from* radar in 1953

1990s: Aging radar network replaced with **Nex**t-generation **Rad**ar (NEXRAD). This network of over 150 Doppler radars can detects winds, allowing forecasters to quickly indentify developing tornadoes. The average lead time for tornado warnings improved from less than 5 minutes before NEXRAD, to 13 minutes.



Computer display of NEXRAD image from deadly Oklahoma City tornado in 1999





Today's radars allow forecasters to monitor horizontal AND vertical storm structure. The images are from tornadic supercells that occurred in the 1999 tornado outbreak in Oklahoma.

Weather Satellites

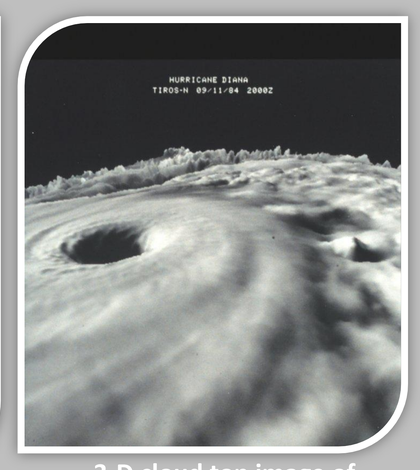
1960: NASA launches TIROS-1 (**T**elevision **I**nf**r**ared **O**bservation **S**atellite), the world's first weather satellite. It remains in space for just 78 days, but proves that weather satellites are practical.

TIROS-1

One of the first images from TIROS-1 (April 1, 1960)

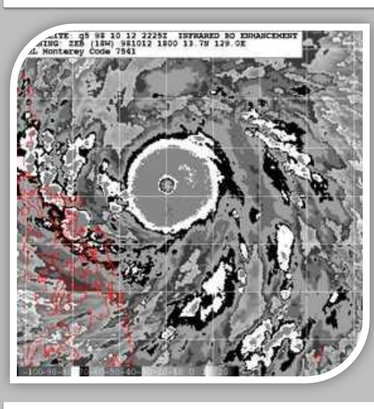
1975: GOES-1 (**G**eostationary **O**perational **E**nvironmental **S**atellite) launches into orbit. Unlike the previous polar-orbiting satellites, GOES remains high above a fixed point to provide continuous coverage of the hemisphere's weather. Along with its TIROS partners, GOES-1 is equipped with infrared sensors, so that weather satellites can take pictures at night as well.

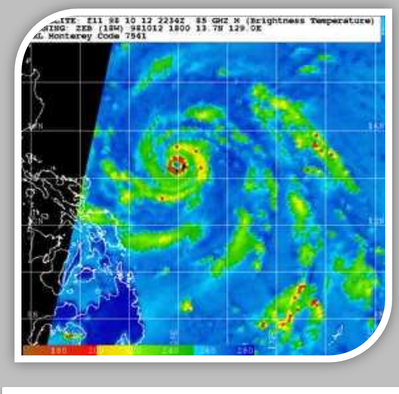
First image (visible) from GOES-1 (October 25, 1975)



3-D cloud top image of hurricane Diana (taken from TIROS-N, 1984)

TODAY: GOES & POES keep constant watch over the western hemisphere. Advances in sensors, space vehicles, communications, & computers allow scientists to look at much more than just clouds.





Forecasters estimate wind speeds of tropical cyclones (like Super Typhoon Zeb) using conventional satellite imagery like this one (IR). This method works well, but high level clouds obscure what is happening below.

Unlike conventional satellite imagery, the image above was taken using a special microwave sensor that can "see through" high level clouds, revealing important storm structure details. The result looks a bit like a radar image.